

## *A2&T Midterm Review Sheet*

**Midterm Exam: Tuesday, January 27<sup>th</sup> 12:15 – 1:45 in the Cafeteria**

### **Exam Format:**

**Part 1: 17 multiple choice questions (no partial credit)**

**Part 2: 9 free response questions (partial credit)**

This review sheet should not be your only study guide. Please be sure to go over your old exams, homework and notes to fully prepare for the midterm.

### **Exponential Equations**

1. Solve each of the following:

(a)  $8^x = 2^{x+6}$

(b)  $4^{2x-3} = \frac{1}{16}$

(c)  $x^{\frac{3}{2}} = 64$

(d)  $125^{-2x} = 25^{x+1}$

(e)  $a^{\frac{3}{5}} - 2 = 25$

(f)  $3(2m+3)^{\frac{2}{3}} + 2 = 77$

### **Rational Expressions**

2. Simplify:  $\frac{6x^2 + 12x}{x^3 - 5x^2 - 14x}$

3. Simplify:  $\frac{x^2 - 2x - 24}{x^2 - 16}$

4. Find the value(s) of  $x$  for which the fraction is undefined:

(a)  $\frac{12}{x-2}$

(b)  $\frac{23}{6x}$

(c)  $\frac{x^2 - 25}{x^2 + 6x + 8}$

In 5 – 8, perform the indicated operations and express answers in simplest form.

$$5. \frac{3}{x+4} + \frac{2}{x}$$

$$6. \frac{5x^2 - 5x - 60}{4x^2 - x} \cdot \frac{x^2 - 3x - 10}{x - 4} \div \frac{x^2 - 2x - 15}{8x^2 - 2x}$$

$$7. \frac{2x^2 - 16}{x^2 - 4} - \frac{x + 4}{x + 2}$$

$$8. \frac{x - 1}{x^2 + 3x + 2} + \frac{x}{x + 1}$$

$$9. \text{ Solve for } x: \frac{1}{6x} + \frac{8}{x} = \frac{x}{6}$$

$$10. \text{ Solve for } x: \frac{4n + 3}{n - 6} + \frac{n - 4}{6 - n} = \frac{44}{2n - 12}$$

$$11. \text{ Simplify each: (a) } \frac{1 + \frac{2}{a}}{\frac{2}{a} - \frac{a}{2}} \quad (b) \frac{x - \frac{9}{x}}{1 + \frac{3}{x}} \quad (c) \frac{1 - \frac{1}{16x^2}}{1 - \frac{1}{4x}} \quad (d) \frac{\frac{c}{2} - \frac{2}{c}}{1 + \frac{c}{2}}$$

### Radicals

$$12. \text{ Simplify: } \frac{\sqrt{900}}{\sqrt{20}}$$

$$13. 2\sqrt{48} + 2\sqrt{12}$$

$$14. \sqrt{49a^2b^4} - \sqrt{16a^2b^4} + \sqrt{8a^2c}$$

$$15. \text{ Simplify: } \frac{3}{6 - 5\sqrt{2}}$$

$$16. \text{ Solve: } \sqrt{3x + 6} - 2 = 7$$

$$17. \text{ Solve: } 2\sqrt{2x - 6} + 8 = 4$$

### ***Complex Numbers***

18. Simplify:  $\sqrt{-45x^4y^7}$
19.  $5\sqrt{-18} + \sqrt{-50} - \sqrt{-75}$
20. Graph  $4 + 3i$
21. Find the value of  $i^{53}$
22.  $(2 - 5i)(6 + 7i)$
23. Find the multiplicative inverse and magnitude of  $7 - 4i$ .
24. In which quadrant would the sum of  $-2 - i$  and  $3 + 5i$  lie?

### ***Factoring***

25. Factor each of the following completely.
- (a)  $3x^2 + 5x - 2$
  - (b)  $16x^4 - y^8$
  - (c)  $2x^2 - 10x - 28$
  - (d)  $x^3 + 3x^2 - 4x - 12$

### ***Quadratics***

26. Find all roots of the equation:  $2x^2 - 3x = 2$
27. Solve by completing the square:  $3x^2 = 6x - 15$
28. Describe the roots of the following quadratic equations:
- (a)  $2x^2 - 3x + 4 = 0$
  - (b)  $\frac{1}{3}x^2 - x = 6$
  - (c)  $x^2 - 6x = -9$
29. Find the sum and product of the roots of  $2x^2 - 6x + 10 = 0$ .
30. Write an equation for the quadratic whose roots are  $3 + \sqrt{2}$  and  $3 - \sqrt{2}$ .

## ***Inequalities***

Solve each inequality and express the solution set in set builder notation.

31.  $|3m - 6| + 4 \geq 22$

32.  $x^2 - x > 6$

33.  $\frac{1}{x} < 1$

Solve each inequality and express the solution set in interval notation.

34.  $x^2 - 7x \leq x$

35.  $|12 - 3x| - 2 \geq 28$

36.  $\frac{9}{x-4} \geq -6$

## ***Solving Higher Degree Polynomials***

Solve each of the following.

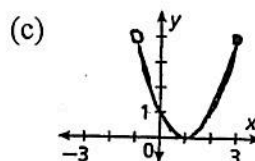
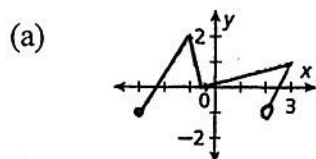
37.  $x^3 + 3x^2 - 9x = 27$

38.  $x^4 - 8x^2 + 16 = 0$

39.  $(x^2 + 5x - 7)(x + 3) = 0$

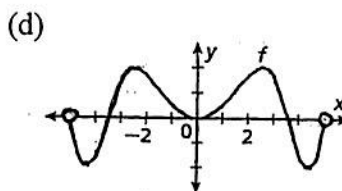
## ***Functions***

40. Give the domain and range for each relation. Then tell whether the relation is a function.



(b)

x	0	2	4	6	2
y	5	8	10	20	12



41. Given  $f(x) = 4 - x^2$ , evaluate  $f(-2)$ .

In 42 – 47, determine whether or not the following relations are functions. *If they are functions:*

- (a) identify each as linear, constant, absolute value, or quadratic
- (b) determine whether or not they are one – to –one and whether or not they are onto

42.  $3x = -10 + 4y$

43.  $x = y^2 - 2y - 24$

44.  $x = 5$

45.  $y = 10$

46.  $y = |2x - 3|$

47.  $y = x^2 - x - 6$

48. Determine the largest possible domain of each of the following functions.

(a)  $f(x) = \frac{x+2}{x^2 - x - 20}$

(b)  $g(x) = \sqrt{2x-5}$

(c)  $h(x) = \frac{1}{\sqrt{3x-15}}$

49. Given  $f(x) = 2\sqrt{x+3}$  and  $g(x) = -3x+1$ , find each value:

(a)  $f(g(1))$

(b)  $g(f(1))$

(c)  $g(f(6))$

50. Given  $f(x) = 4x+3$  and  $g(x) = \frac{x}{x+3}$ , find:

(a)  $f(g(x))$

(b)  $g(f(x))$

51. Given  $h(x) = -x^2 - 2$  and domain  $-3 \leq x \leq 3$ , find the largest element in the range.

52. Given  $f(x) = \frac{7-8x}{3}$ , find the inverse of  $f(x)$ . Is  $f(x)$  one to one?
53. Determine the domain and range of  $f(x) = \{(1,2), (3,4), (5,6), (7,8)\}$ . Find the inverse of  $f(x)$ . Is  $f(x)$  one to one?

### ***Direct and Inverse Variation***

54. If  $x$  and  $y$  vary directly and  $x = 3$  when  $y = 9$ , find  $x$  when  $y = 4.5$ .
55. If  $x$  and  $y$  vary inversely and  $x = 5$  when  $y = 9$ , find  $x$  when  $y = 20$ .
56. Sketch the graph of  $xy = -18$ .
57. The amount of money raised at the Cancer Benefit Fashion Show is directly proportional to the number of people who attend. The amount of money raised when 50 people attend would be \$2000. How much money will be raised if 80 people attend?
58. Dr. Jacobs realized that the number of cavities that develop in a patient's mouth each year is inversely proportional to the number of minutes spent brushing your teeth at a given time. If one of his patients developed 6 cavities during the year and spent 30 seconds brushing his teeth at each session, how many cavities will this patient develop if he increases his brushing time to 90 seconds?

### ***Absolute Value Equations***

59. What is the solution set of the equation  $|4a + 6| - 4a = -10$ ?
60. Solve for  $x$  :  $|4x - 5| = 3$ .

### ***Laws of Exponents***

61. Simplify each expression and write the answer using only positive exponents:

(a)  $\frac{2x^{-2}y^{-2}}{4y^{-5}}$                       (b)  $\frac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}}$

62. Rewrite the expression  $x^{-\frac{2}{5}}$  as an equivalent expression in radical form.